



**[4910-13]**

## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

#### **14 CFR Part 25**

#### **[Docket No. FAA-2014-0303; Special Conditions No. 25-561-SC]**

**Special Conditions:** Airbus Model A350-900 Airplane; Operation Without Normal Electrical Power

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special condition; request for comments.

**SUMMARY:** These special conditions are issued for the Airbus Model A350-900 airplane. This airplane will have a novel or unusual design feature associated with operation without normal electrical power. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** The effective date of these special conditions is **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. We must receive your comments by **[INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

**ADDRESSES:** Send comments identified by docket number FAA-2014-0303 using any of the following methods:

- Federal eRegulations Portal: Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.

Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.

Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays.

Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Nazih Khaouly, FAA, Airframe and Flightcrew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone (425) 227-2432; facsimile (425) 227-1320.

## **SUPPLEMENTARY INFORMATION:**

The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions is impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected aircraft. In addition, the substance of these special conditions has been subject to the public-comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon publication in the Federal Register.

### **Comments Invited**

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

### **Background**

On August 25, 2008, Airbus applied for a type certificate for their new Model A350-900 airplane. Later, Airbus requested, and the FAA approved, an extension to the application for FAA type certification to November 15, 2009. The Model A350-900 airplane has a conventional layout with twin wing-mounted Rolls-Royce Trent XWB engines. It features a twin-aisle, 9-abreast, economy-class layout, and accommodates side-by-side placement of LD-3 containers in the cargo compartment. The basic Airbus Model A350-900 airplane configuration will accommodate 315 passengers in a standard two-class arrangement. The design cruise speed is Mach 0.85 with a maximum take-off weight of 602,000 lbs.

The Airbus Model A350-900 airplane fly-by-wire control system requires a continuous source of electrical power to maintain an operable flight-control system. The current rule, Title 14, Code of Federal Regulations (14 CFR) 25.1351(d), Amendment 25-72, requires safe operation under visual flight rules (VFR) conditions for at least five minutes after loss of all normal electrical power. This rule was structured around a traditional design utilizing mechanical control cables for flight control while the crew took time to sort out the electrical failure, start engine(s) if necessary, and re-establish some of the electrical-power-generation capability.

To maintain the same level of safety associated with traditional designs, Airbus Model A350-900 airplanes must be designed for operation with the normal sources of engine- or Auxiliary Power Unit (APU)-generated electrical power inoperative. Service experience has shown that loss of all electrical power from the airplane's engine and APU-driven generators is not extremely improbable. Therefore, it must be shown that the airplane is capable of recovering adequate primary electrical-power generation for safe flight and landing with the use of its emergency electrical-power systems. These emergency electrical-power systems must be able to power loads that are essential for continued safe flight and landing.

### **Type Certification Basis**

Under 14 CFR 21.17, Airbus must show that the Airbus Model A350-900 airplane meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25-1 through 25-129.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Airbus Model A350-900 airplane because of a novel or unusual design feature, special conditions are prescribed under § 21.16. These special conditions are an extension of part 25 due to the inadequacies of the existing part 25 requirements to address loss of all normal electrical power.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, the special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Airbus Model A350-900 airplane must be shown to comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36. The FAA must issue a finding of regulatory adequacy under section 611 of Public Law 92-574, the “Noise Control Act of 1972.”

The FAA issues special conditions, as defined in 14 CFR 11.19, under § 11.38, and they become part of the type-certification basis under § 21.17(a)(2).

### **Novel or Unusual Design Features**

The Airbus Model A350-900 airplane incorporates the following novel or unusual design features: the capability of continued safe flight and landing that are dependent on one or more continuous sources of electrical power.

Due to rapid improvements in airplane technology, the applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. These special conditions for the Airbus Model A350-900 airplane contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

In addition to an electronic flight-control system, a number of systems that have traditionally been mechanically operated have been implemented as electrically powered systems on the Model A350-900 airplane. The criticality of some of these systems is such that their

failure will either reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions, or prevent continued safe flight and landing of the airplane.

## **Discussion**

The current rule, 14 CFR 25.1351(d), Amendment 25-72, requires safe operation under VFR conditions for at least five minutes after loss of all normal electrical power. This rule was structured around traditional airplane designs that use mechanical control cables and linkages for flight control. These manual controls allow the flightcrew to maintain aerodynamic control of the airplane for an indefinite time after loss of all electrical power. Under these conditions, the mechanical flight-control system provides the flightcrew with the ability to fly the airplane while attempting to identify the cause of the electrical failure, start the engine(s) if necessary, and reestablish some of the electrical-power-generation capability, if possible.

To maintain the same level of safety associated with traditional designs, the Airbus Model A350-900 airplane must be designed for operation with the normal sources of engine- and APU-generated electrical power inoperative. The FAA has identified electrically powered functions required to safely complete a maximum ETOPS diversion as another potential catastrophic effect from the loss of all normal electrical power. Service history has shown that analytical means have not been accurate at anticipating common-cause failures, nor have such means been accurate at predicting that loss of all normal sources of electrical power is extremely improbable.

Airbus must demonstrate that the airplane is capable of recovering adequate primary electrical-power generation during ETOPS, and for continued safe flight and landing. An alternative source of electrical power would have to be provided for the time necessary to restore

the minimum power-generation capability necessary during ETOPS, and for continued safe flight and landing.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

### **Applicability**

As discussed above, these special conditions are applicable to the Airbus Model A350-900. Should Airbus apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well.

### **Conclusion**

This action affects only certain novel or unusual design features on the Airbus Model A350-900 airplane. It is not a rule of general applicability.

### **List of Subjects in 14 CFR Part 25**

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

### **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Airbus Model A350-900 airplanes.

In lieu of the requirements of 14 CFR 25.1351(d) the following special conditions apply:

1. The applicant must show by test, or a combination of test and analysis, that the airplane is capable of continued safe flight and landing with all normal sources of engine- and APU-generated electrical power inoperative as prescribed by paragraphs 1.a. and 1.b. below. For purposes of these special conditions, normal sources of electrical power generation do not include any alternate power sources such as batteries, ram-air turbine (RAT), or independent power systems such as the flight-control permanent magnet generating system. In showing capability for continued safe flight and landing, consideration must be given to systems capability, effects on flightcrew workload and operating conditions, and the physiological needs of the flightcrew and passengers for the longest diversion time for which approval is sought.
  - a. Common mode failures, cascading failures, and zonal physical threats must be considered in showing compliance with this requirement.
  - b. In showing compliance with this requirement, the ability to restore operation of portions of the electrical-power generation and distribution system may be considered if it can be shown that unrecoverable loss of those portions of the system is extremely improbable. An alternative source of electrical power must be provided for the time required to restore the minimum electrical-power generation capability required for continued safe flight and landing. Unrecoverable loss of all engines may be excluded when showing that unrecoverable loss of critical portions of the electrical system is extremely improbable.



2. Regardless of any electrical generation-and-distribution system-recovery capability shown under paragraph 1, above, sufficient electrical-system capability must be provided to—
  - a. allow time to descend, with all engines inoperative, at the speed that provides the best glide distance, from the maximum operating altitude to the top of the engine-restart envelope, and
  - b. subsequently allow multiple start attempts of the engines and APU. This capability must be provided in addition to the electrical capability required by existing part 25 requirements related to operation with all engines inoperative.
3. The electrical energy the airplane uses in descending with engines inoperative, from the maximum operating altitude at the best glide speed, and in making multiple attempts to start the engines and APU, must be considered when showing compliance with paragraphs 1 and 2 of these special conditions, and with existing 14 CFR part 25 requirements related to continued safe flight and landing.

Issued in Renton, Washington, on July 23, 2014.

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Acting Manager, Transport Airplane Directorate,  
Aircraft Certification Service.

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